

## 1,3-DICHLOROPROPENE

1,3-Dichloropropene is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 542-75-6

$\text{CH}_2\text{ClCH}=\text{CHCl}$

Molecular Formula:  $\text{C}_3\text{H}_4\text{Cl}_2$

1,3-Dichloropropene is a clear or straw colored liquid with a penetrating, irritating, chloroform-like odor. It is relatively insoluble in water and is soluble in ether, acetone, toluene, and benzene. 1,3-Dichloropropene is flammable and when heated to decomposition it produces toxic fumes of hydrochloric acid and other chlorinated compounds as well as irritating gases (NTP, 1994).

### Physical Properties of 1,3-Dichloropropene

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Synonyms: Telone; Telone II; 1,3-dichloropropylene;  $\gamma$ -chloroallyl chloride

Molecular Weight:	110.98
Boiling Point:	108 °C
Melting Point:	less than -50 °C
Flash Point:	35 °C (95 °F) open cup
Vapor Density:	3.8 (air = 1)
Density/Specific Gravity:	1.225 at 25/4 °C (water = 1)
Vapor Pressure:	28 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	1.36 (cis isomer) 1.41 (trans isomer)
Conversion Factor:	1 ppm = 4.54 mg/m <sup>3</sup>

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(HSDB, 1991; Merck, 1983; Sax, 1987)

## SOURCES AND EMISSIONS

### A. Sources

1,3-Dichloropropene is used in oil and fat solvents and in dry cleaning and degreasing processes. The chlorination of organic materials during disinfection of drinking water and wastewater can result in the formation of 1,3-dichloropropene (HSDB, 1991).

The primary sources of 1,3-dichloropropene emissions in California reported in the United States Environmental Protection Agency's (U.S. EPA) 1995 Toxics Release Inventory (TRI) Public Data Release Report were the chemical and allied products industries (U.S. EPA, 1996b).

1,3-Dichloropropene is registered as a biocide/soil fumigant. It is used for pre-plant soil sterilization for control of soil-borne fungi, insects, and nematodes. It is applied to fallow agricultural land prior to planting a variety of crops. It is also applied in orchards and vineyards as a spot treatment prior to re-planting trees and vines (DPR, 1996).

The licensing and regulation of pesticides for sale and use in California are the responsibility of the Department of Pesticide Regulation (DPR). Information presented in this fact sheet regarding the permitted pesticidal uses of 1,3-dichloropropene has been collected from pesticide labels registered for use in California and from DPR's pesticide databases. This information reflects pesticide use and permitted uses in California as of October 15, 1996. For further information regarding the pesticidal uses of this compound, or the latest permit conditions, please contact the Pesticide Registration Branch of DPR (DPR, 1996).

## B. Emissions

In 1995, under DPR's guidance, the registrant of 1,3-dichloropropene began limited reintroduction of its use for soil fumigation with modified application methods, buffer zones, special permit conditions, and ambient monitoring to assure safe levels are not exceeded (DPR, 1994b). At the request of DPR, the Air Resources Board (ARB) conducted ambient air monitoring for 1,3-dichloropropene in 1995 in Merced and Kern Counties; monitoring results are located in the "Ambient Concentrations" section below. Since 1,3-dichloropropene's permit conditions were revised in 1996 by DPR, ARB also conducted ambient air monitoring in Kern County in 1996. These results are still being compiled and evaluated.

In California, approximately 1,000 pounds of 1,3-dichloropropene emissions were reported in the U.S. EPA 1995 TRI Public Data Release Report (U.S. EPA, 1996b).

## C. Natural Occurrence

No information regarding the natural occurrence of 1,3-dichloropropene was found in the readily-available literature.

## AMBIENT CONCENTRATIONS

At the request of DPR, the ARB conducted ambient monitoring in April and May 1990 for 1,3-dichloropropene at 5 sites in Merced County near areas where it was used as a soil fumigant prior to planting sweet potatoes and sugarbeets. Samples were collected 4 days a week from April 2 through May 4, 1990, with concentrations ranging from 0.1 to 160 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) or 0.02 to 35.24 parts per billion (ppb). Average concentrations at the sites ranged from 0.8 to  $24.5\mu\text{g}/\text{m}^3$  (0.18 to 5.40 ppb) at populated sites close to application areas. These

results reflect 5 weeks of sampling where no applications occurred after the first 2 weeks due to suspension of use based on initial results (ARB, 1991a).

The ARB conducted 1,3-dichloropropene monitoring in March and April 1995 at five sites in Merced County. Low levels of 1,3-dichloropropene were detected: 24-hour concentrations ranged from 0.11 to 7.4  $\mu\text{g}/\text{m}^3$  (0.02 to 1.63 ppb). One hundred and sixty-seven of the two hundred and sixteen samples collected were below the detection limit (approximately 0.1  $\mu\text{g}/\text{m}^3$  or 0.02 ppb). The remaining 45 samples ranged between the detection limit and 1.0  $\mu\text{g}/\text{m}^3$  (0.22 ppb). Mitigating measures, reduced number of applications, and the unusually rainy weather were contributors to the low levels found (ARB, 1996c).

The ARB conducted 1,3-dichloropropene monitoring from May to December 1995, at five sampling sites in Kern County. A wide range of concentrations of 1,3-dichloropropene were detected: 24-hour values ranged from 0.10  $\mu\text{g}/\text{m}^3$  (0.02 ppb) to a maximum concentration of 27.0  $\mu\text{g}/\text{m}^3$  (5.95 ppb). Only 86 (excluding duplicates) of the 494 samples collected were above the limit of detection (approximately 0.1  $\mu\text{g}/\text{m}^3$  or 0.02 ppb). Of these, 25 were 1.0  $\mu\text{g}/\text{m}^3$  (0.22 ppb) or greater. No applications were made from August 10 through November 10, 1995 (ARB, 1996d).

Also, in 1990, the U.S. EPA compiled ambient air data from several locations throughout the United States. A mean concentration of 0.13  $\mu\text{g}/\text{m}^3$  (0.03 ppb), with an overall data range of 0 to 18.2  $\mu\text{g}/\text{m}^3$  (0 to 4.01 ppb) was reported (U.S. EPA, 1993a).

## **INDOOR SOURCES AND CONCENTRATIONS**

No information regarding the indoor sources and concentrations of 1,3-dichloropropene was found in the readily-available literature.

## **ATMOSPHERIC PERSISTENCE**

In the troposphere, 1,3-dichloropropene reacts with hydroxyl (OH) radicals and ozone ( $\text{O}_3$ ), with the OH radical reaction being calculated to dominate as an atmospheric loss process. The calculated half-life and lifetime of cis- and trans-1,3-dichloropropene due to reaction with the OH radical are 1.2 days and 1.7 days, respectively, for the cis-isomer and 0.7 days and 1.0 days, respectively, for the trans-isomer (Atkinson, 1995). The formation of formyl chloride and chloroacetaldehyde may be expected from this reaction (Kao, 1994).

## **AB 2588 RISK ASSESSMENT INFORMATION**

1,3-Dichloropropene emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

## HEALTH EFFECTS

Probable routes of human exposure to 1,3-dichloropropene are inhalation, ingestion, and dermal contact.

**Non-Cancer:** 1,3-Dichloropropene vapors are irritating to the eyes and respiratory tract. Delayed pulmonary edema may result. Symptoms include eye, nose, and throat irritation, headache, dizziness, nausea, vomiting, chest pain, and breathing difficulties. Chronic dermal exposure may result in skin sensitization in humans. 1,3-Dichloropropene causes liver, kidney, and pancreatic injury in test animals (Olson, 1994).

The U.S. EPA has established a Reference Concentration (RfC) for 1,3-dichloropropene of 0.02 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ), based on hypertrophy/hyperplasia of nasal respiratory epithelium in mice. The U.S. EPA estimates that inhalation of this concentration or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects. The oral Reference Dose (RfD) established by the U.S. EPA is 0.0003 milligrams per kilogram per day based on increased organ weights in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects (U.S. EPA, 1994a).

The U.S. EPA reports that no significant effect on fertility was found in a study of male workers exposed to levels occurring in the manufacturing workplace (U.S. EPA, 1994a).

**Cancer:** Limited information exists on the carcinogenic effects of 1,3-dichloropropene in humans. Two cases of histiocytic lymphomas and one case of leukemia have been reported in humans accidentally exposed by inhalation. The U.S. EPA has classified 1,3-dichloropropene in Group B2: Probable human carcinogen (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified the potential carcinogenicity of 1,3-dichloropropene (technical-grade) in humans in Group 2B: Possible human carcinogen based on sufficient evidence in animals (IARC, 1987a).

The State of California has determined under Proposition 65 that 1,3-dichloropropene is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is  $1.6 \times 10^{-5}$  (microgram per cubic meter)<sup>-1</sup> (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to  $1 \mu\text{g}/\text{m}^3$  of 1,3-dichloropropene is estimated to be no greater than 16 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is  $1.8 \times 10^{-1}$  (milligram per kilogram per day)<sup>-1</sup> (OEHHA, 1994).